NEUROBIOLOGY, 2009

ELECTROPHYSIOLOGY

June 6 – June 26

Lectures

Week 1	*Introduction to Electrophysiology*		
June 7-Sun	**16:00-17:15**	Electrophysiology Module Orientation	Isabel Llano
June 8-Mon	**9:00-12:00**	The nerve impulse and the proteins that sense electric fields	Francisco Bezanilla
June 9-Tues	**9:00-12:00**	Whole-cell recording	Alain Marty
June 10-Wed	**9:00-12:00**	Gating mechanisms of ion channels	Gary Yellen
June 11-Thur	**9:00-12:00**	Single channel recording	Jon Sack
June 12-Fri	**9:00-12:00**	Structure of ion channels	Roderick MacKinnon
June 13-Sat		*experimental work and discussion session*	
June 14-Sun		*Sunday – Off*	
Week 2			
June 15-Mon	**9:00-12:00**	Excitatory synaptic transmission	Osvaldo Utchitel
	8:00pm	**Monday Night Seminar/Kravitz Lecture**	Tom Schwarz
		"Building Boutons and Moving Mitochondria"	
June 16-Tues	**9:00-12:00**	Ion channels involved in touch and pain	Diana Bautista
June 17-Wed	**9:00-12:00**	Mechanosensitive ion channels	William Roberts
June 18-Thur	**9:00-12:00**	Function and Development of Neural Circuits	Carlos Aizenman
June 19-Fri	**9:00-12:00**	Olfactory Processing	Ricardo Araneda
June 20-Sat		*experimental work*	
June 21-Sun		*Sunday – Off*	
Week 3			
June 22-Mon	**9:00-12:00**	Regulation of excitation and synaptic transmission	Larry Trussell
	8:00pm	**Monday Night Seminar**	Karl Deisseroth
June 23-Tues	**9:00-12:00**	Synaptic plasticity	Julie Kauer
June 24-Wed	**9:00-12:00**	Cyclic Nucleotide gated channels	Steven Siegelbaum
June 25-Thurs	**9:00-12:00**	Light activated channels	Karl Deisseroth
June 26-Fri	**3:00-6:00**	*Student Presentations* End of Section Party	

ELECTROPHYSIOLOGY LAB STATIONS

Week 1: Sunday afternoon an orientation session will be held to describe basic aims and experimental approaches and to introduce the faculty and teaching assistants. Students will be asked to briefly describe their present research activities and expectations from the course.
From Monday through Saturday students will do 6 afternoons of rotations, one day at each of the 6 different electrophysiology set-ups. Saturday late afternoon there will be a discussion session on potential projects for each experimental set-up and students will be assigned to one of the 6 set-ups.
Weeks 2 and 3: Starting on Monday June 15, students are divided in 6 groups and will focus on a project. Results from projects are presented in short talks on the afternoon of Friday June 26.
The 6 preparations and faculty/assistants in charge are: olfactory slices (Ricardo Araneda and Richard Smith, University of Maryland); acutely dissociated neurons (Diana Bautista and Kristin Gerhold, UC Berkeley); cerebellar slices (Isabel Llano and Alain Marty, University of Paris; Federico Trigo, University of Montevideo); *Xenopus* tadpole tectum (Carlos Aizenman and Mark Bell, Brown University); transfected HEK cells (Jon Sack and Helgi Ingolfsson, Institute for Design of Intelligent Drugs); neuromuscular junction (Osvaldo Uchitel, Carlota Inchauspe, Francisco Urbano, Universidad de Buenos Aires).

ELECTROPHYSIOLOGY DAILY SCHEDULE

Lectures and associated discussion start at 9 am sharp and finish before noon, Monday through Friday. Lab typically starts 2 hours after lecture and proceeds late into the night, around midnight. Saturday sessions start at 10 am and ends at dinner. The lab is Loeb room 25. Lectures are in Marine Resources Center, room 210. The Monday Night Fights seminar series (8 pm Mondays, Whitman auditorium) is required.

ELECTROPHYSIOLOGY LECTURERS

Francisco Bezanilla,The University of Chicago
Karl Deisseroth, Stanford University
Julie A Kauer, Brown University
Roderick MacKinnon, Rockefeller University
William Roberts, Oregon University
Steven Siegelbaum, Columbia University
Larry Trussell, Vollum Institute
Gary Yellen, Harvard University Medical School

ELECTROPHYSIOLOGY FACULTY AND TEACHING ASSISTANTS

team 1: Ricardo Araneda, Richard Smith (University of Maryland)
team2 : Diana Bautista, Kristin Gerhold (UC Berkeley)
team 3: Osvaldo D Uchitel, Francisco Urbano, Carlota Inchauspe (University of Buenos Aires)
team 4: Isabel Llano, Alain Marty (CNRS, University of Paris), Federico Trigo (University of Montevideo)
team 5: Jon Sack, Helgi Ingolfsson (Institute for Design of Intelligent Drugs)
team 6: Carlos Aizenman, Mark Bell (Brown University)
Demonstrations on optogenetics: June22-25: Karl Deisseroth, Feng Zhang (Stanford University)

IMAGING
June 30 – July 19

Lectures

Week 1	*Introduction to Light, Fluorescent, and Electron Microscopy*		
June 29-Mon	**9:00-9:15**	Imaging Module Orientation	Kurt Haas
	9:15-12:00	Introduction to light microscopy	Jeff Lichtman
	8:00pm	**Monday Night Seminar**	Alice Ting
	"Protein-protein interaction imaging across the synaptic cleft"		
June 30-Tues	**9:00-12:00**	Introduction to fluorescent microscopy	Jeff Lichtman
July 1-Wed	**9:00-12:00**	Confocal Microscopy	Stephen Smith
	Afternoon/pit	Array Tomography	Kristina Micheva
July 2-Thur	**9:00-12:00**	2-Photon Microscopy	Ben Stowbridge
July3-Fri	**9:00-10:15**	Introduction to electron microscopy	Tom Reese
	10:45-12:00	Immunolabeling in EM	Kathryn Commons
July 4-Sat		*Fourth of July Parade*	
July 5-Sun		*Sunday – Off*	
Week 2	*Advanced Fluorescent Techniques*		
July 6-Mon	**9:00-12:00**	Advanced Fluores Technqs: FRET & FLIM	Ryohei Yasuda
	8:00pm	**Monday Night Seminar**	**Thanos Tzounopoulos**
"Mechanisms and Function of Spike Timing-Dependent Plasticity During Early Auditory Processing			
July 7-Tues	**9:00-12:00**	Photostimulation	Ingrid Bureau
July 8-Wed	**9:00-12:00**	In vivo Imaging in Rodent CNS	Tom Misgeld
July 9-Thur	**9:00-12:00**	Neuronal development in vivo	Ed Ruthazer
July 10-Fri	**9:00-12:00**	Imaging the rodent NMJ	Yi Zuo
July 11-Sat	**9:00-10:30**	Round table discussion	All faculty
July 12-Sun		*Sunday - Off*	
Week 3	*3 D reconstruction for understanding circuit function*		
July 13-Mon	**9:00-12:00**	In vivo multiphoton Ca imaging to reveal cerebellar function	Sam Wang
	8:00pm	**Monday Night Seminar**	**Larry Cohen**
W"hat the nose tells the bulb (something known); response in the bulb (mostly black hole); bulb output (black hole)"			
July 14-Tues	**9:00-12:00**	super resolution imaging techniques	Jim Galbraith
July 15-Wed	**9:00-12:00**	science and the NIH	Story Landis
July 16-Thurs	**9:00-12:00**	Imaging spine plasticity	Linda van Aelst
July 17-Fri	**3:00-6:00**	Student Presentations	
July 17-Fri	**6:00**	PARTY	

IMAGING LECTURERS
Jeff Lichtman, Harvard

Alice Ting, Harvard
Sam Wang, Princeton
Gordon MS Shepherd, Northwestern
Larry Cohen, Yale
Jim Galbraith, NIH
Story Landis, NIH
Linda van Aelst, Cold Spring Harbor Lab

IMAGING FACULTY, TEACHING ASSISTANTS, TOPICS

Tom Misgeld, **Leanne Godinho**, **Ju Lu** Confocal microscopy: Plasticity at NMJ, spinal cord; retina- live imaging of transgenic GFP mice & zebrafish
Tom Reese, Katy Commons, JoAnn Buchanan – EM: Synaptic Organization
Kristina Micheva, Nick Weiler –Array Tomography
Stephen Smith – Confocal: in vivo imaging: circuit development
Ryohei Yasuda, Ana Oliveira - 2-Photon: Calcium imaging, FRET, FLIM
Ed Ruthazer, Neil Schwartz – : In vivo imaging of retinotectal circuit development
Ingrid Bureau, Charlie Anderson, Taro Kiritani - photostimulation and circuit mapping
Ben Stowbridge, Phil Larimer – 2-photon combined with recording
Yi Zuo, Tonghui Xu – Confocal: barrel cx and NMJ, neuron/glia imaging

Labs (2:00pm – 12:00am)
Week 1 Rotations on various scopes
Week 2 Independent student projects
Week 3 Independent student projects

Faculty, Microscope rigs and preparations:

Tom Reese	Electron Microscope	
Katy Commons	Immuno Electron Microscopy	
Tom Misgeld	Olympus BX51WI; Solamere Spinning Disk	
Kristina Micheva	Zeiss Axioimager for Array Tomography	
Ryohei Yasuda	2-Photon	Rat brain slices
Ben Stowbridge	Olympus BX51WI, will build 2- Photon:	Rat brain slices
Edward Ruthazer	Perkin Elmer Spinning Disk	Xenopus tadpole
Yi Zuo	Prairie 2-photon	Rodent cortex
Ingrid Bureau	Photostimulation	Rodent slices

NEUROBIOLOGY, 2008

Molecular Biology
July 20 – Aug 8

July 20-Mon	**9:00-10:30**	Introduction (faculty and rotation/research)	Yishi Jin
	1pm—	rotation begins	
	8:00pm	**Monday Night Seminar**	**Yishi Jin**
	"Synapse formation and axon regeneration in *C. elegans"*		
Week 1	*Introduction to molecular biology, genetics, cell biology and biochemistry*		
July 21-Tues	**9:00-10:30**	Genetics	Maureen Barr
	4:00-5:00	research talk	Maureen Barr
July 22-Wed	**9:00-10:30**	Molecular Biology	Elva Diaz
	4:00-5:00	research talk	Elva Diaz
	8:00-9:00	*Tracing CNS Circuits (NS&B)*	*Ed Callaway*
July 23-Thur	**9:00-10:30**	Cell Biology	Peter Scheiffele
	4:00-5:00	research talk	Peter Scheiffele
July 24-Fri	**9:00-10:30**	Human Genetics	Louis Ptacek
	4:00-5:00	research talk	Louis Ptacek
July 25-Sat	**9:00-12:00**	**round table discussion**	**all faculty**
	6pm	**BBQ**	
July 26-Sun		*Sunday – Off*	
Week 2	*NS development function and diseases*		
July 27-Mon	**9:00-10:30**	psychiatric disorders	Li-Huei Tsai
	8:00pm	**Monday Night Seminar**	Li-Huei Tsai
	"Epigenetic regulation of memory formation in health and disease."		
July 28-Tues	**9:00-10:30**	Signal transduction	Matthew Dalva
	4:00-5:00	research talk	Matthew Dalva
July 29-Wed	**9:00-10:30**	Mouse neural development	Monica Vetter
	4:00-5:00	research talk	Monica Vetter
July 30-Thur	**9:00-10:30**	Drosophila neural development	Akira Chiba
	4:00-5:00	research talk	Akira Chiba
July 31-Fri	**9:00-10:30**	Ion channels	Villu Maricq
	4:00-5:00	special lecture "Small RNAs and Aging"	Gary Ruvkun
Aug 1-Sat	**9:00 am-**	**experimentation**	
	4:00-5:00	research talk	Villu Maricq
	6pm	BBQ/fun	
Aug 2-Sun		*Sunday - Off*	

Week 3	***<u>NS</u> development, function, diseases, stem cells***		
Aug 3-Mon	**9:00-10:30**	Stem cells	**Fiona Doetsch**
	8:00pm	**Monday Night Seminar**	**Fiona Doetsch**
	"Stem cells and their niche in the adult mammalian brain"		
Aug 4-Tues	**9:00-10:30**	Fish neurobiology	Phil Washbourn
	4:00-5:00	research talk	Phil Washbourn
Aug 5-Wed	**9:00-10:30**	Synapse biology	Grae Davis
	4:00-5:00	research talk	Grae Davis
Aug 6-Thurs	**9:00-10:30**	Neuronal RNA binding proteins	Bob Darnell
	4:00-5:00	Massey lecture	Bob Darnell
Aug 7-Fri	***3:00-6:00pm***	**Student Presentations**	
	7 pm-	end of course PARTY!!	
Aug 8-Saturday	**9:00-5:00**	CLEANUP: ALL FACULTY, TA'S AND STUDENTS MUST PARTICIPATE	
Aug 9 – Sunday		Departure	

Molecular Biology daily schedule:

9-10:45 am: lecture
11 am-4pm: first phase of experimentation
4-5:15 pm research talk
5:30-8pm dinner and free time (or experiments)
8pm-12am second phase of experimentation
Lectures and experiments run Mon-Sat for the first two weeks, and Mon-Th for the last week.

Molecular Biology Lab Rotations (July 20-22):
The goal of the rotation is to learn the basic methodology in molecular biology, manipulation of model organisms and cell culture. These include: DNA preparation, PCR, Protein analysis, RNA isolation, Cell transfection, microinjection, phenotype recognition, immunostaining or RNA in situ. Students will be in a group of two and rotate with all faculty.

Molecular Biology Research Project (July 23-Aug 7):
Students are divided into group of two.
Research long-projects range from: Zebrafish synapse development, Drosophila axon development, C. elegans sensory and behavior genetics, Mouse CNS development, and molecular and cell biology of CNS synapses.

Research team (instructors and TAs):
Team 1: Phil Washbourne + Courtney Easley-Neal (Univ. Oregon).
Zebrafish neural development
Team 2: Matthew Dalva + Martin Hruska (U. Penn)
Mouse CNS synaptogenesis
Team 3: Peter Schefflei + Harald Witte (Univ. Basel)
Neurexin in synapses and others?
Team 4: Elva Diaz + Gustavo Barisone (UC Davis)
Gene expression in developing mouse brain
Team 5: Mauree Barr + Natalia Morisci + Bob O'Hagan (Rutgers)
C. elegans sensory neuron biology
Team 6: Akira Chiba + Daichi Kamiyama (U. Miami)
Drosophila motor neuron biology

Lecturers:
Louis Ptacek (UCSF): human diseases and underlying mechanisms
Li-Huei Tsai (MIT): mechanisms for neurological diseases in mouse models
Monica Vetter (Univ. Utah): vertebrate retina development
Villu Maricq (Univ. Utah): glutamate receptor trafficking and function in c. elegans
Grae Davis (UCSF): NMJ development and function in drosophila
Robert Darnell (Rockefeller Univ.): neuronal RNA binding proteins and diseases
Fiona Doetsch (Columbia Univ): stem cells in adult brain
Gary Ruvkun (MGH, Harvard Medical School): miRNA and aging